Speaker Abstracts

2004 State-County Ground Water Symposium

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BAY RESTORATION FUND – IMPACTS ON ON-SITE DISPOSAL SYSTEMS

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In the 2004 legislative session Governor Ehrlich's Bay Restoration Fund was approved. The purpose of this fund is to upgrade sewage treatment plants and on-site sewage disposal systems to improve the quality of the waters of the State. This presentation provides an overview of the Bay Restoration Fund and briefly focuses on on-site sewage disposal systems.

WHEN ARE "POOR PERKING" SOILS THE BEST SOILS?

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This paper is designed to stimulate thinking by challenging conventional wisdom in the use of "poor perking" soils for land based wastewater treatment and dispersal systems. Who among us would prefer a site with moderately well drained slowly permeable soils over a site with well-drained highly permeable soils? Yet, based on the criteria of protecting public health and the environment, this paper will argue that more slowly permeable soils may well offer the "best" lowest risk sites, particularly in environmentally sensitive areas. Utilization of drip irrigation dispersal at very low application rates has changed the landscape by allowing wastewater dispersal systems to be located in more slowly permeable soils near the surface within the biologically active root zone. Using a case study from of a site with "poor perking" soils in St. Mary's county and drawing from past research by Bouma, Converse, Tyler et al, the case for "Poor Perking" Soils as the Best Soils will be made.

CAPACITY ISSUES FOR COMMUNITY GROUND WATER SYSTEMS

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Rapid growth of communities on public water systems can potentially outpace the development of adequate water system capacity. A survey of County officials involved in the approval of new development revealed wide variations and some potential gaps in the approval process, relative to assuring adequate capacity. A task force was formed to assess existing and proposed procedures, and to draft guidelines on how to assess system capacity, track allocated capacity, and assure that adequate capacity will be available when a commitment is made to supply new development. This presentation will outline the proposed guidelines and focus on defining water system capacity for ground water systems.

GROUND WATER ISSUES FOR SMALL TOWNS AND COMMUNITES IN THE PIEDMONT

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Mount Airy has experienced significant growth over the past decade. This session will focus on the policy initiatives implemented by the local government to protect the town's water supply. The presentation will outline background on growth, the creation of an Adequate Public Facilities Ordinance (APFO), implementation of the APFO, and on-going regional efforts to work efficiently and effectively with the Maryland Department of the Environment.

GROUND WATER ISSUES IN SOUTHERN MARYLAND – FINDINGS OF THE ADVISORY COMMITTEE ON THE MANAGEMENT AND PROTECTION OF THE STATE'S WATER RESOURCES

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In response to the drought of 2002, Governor Ehrlich issued an executive order creating the **Advisory Committee on the Management and Protection of the State's Water Resources** and charged the Committee with several responsibilities, principally to evaluate the sustained ability of Maryland to meet its projected water needs. The Southern Maryland pilot study area was chosen to demonstrate the water supply issues in an area of the State that relies almost solely on ground water from deep aquifers that are more sensitive to changes in water use than to variations in annual precipitation. While there was some effort made to compare projected demands with available water, the principal goal was to demonstrate the information needed and potential approaches in conducting such an analysis. This presentation will summarize the approach taken to analyze the adequacy of water supply aquifers and will discuss the implications for ground water users in Southern Maryland.

SECURITY ISSUES FOR GROUND WATER SYSTEMS

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This presentation will briefly cover the requirements of the Bioterrorism Act applicable to community water systems and the status of compliance with these requirements. An overview will be provided of the continued concerns for the security at water systems (with emphasis on small ground water systems), tools developed by EPA to assist water systems,

and actions that water systems are encouraged to take to be better prepared to respond to emergencies.

VEHICLE WASHWATER – KEEPING IT OUT OF OUR GROUND WATER

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The presentation will include the facility owner's perception of washwater, chemical composition of vehicle effluent, car wash wells, treatment options, mobile wash systems, impacts on ground and surface water, and best management practices involving car washing.

HYDROGEOLOGIC CONTROLS ON WATER INTRUSION INTO SUBWAY TUNNELS CONSTRUCED IN FRACTURED ROCK, WASHINGTON DC AND MD, USA

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Excessive water intrusion has been observed along stretches of underground subway tunnels constructed in fractured rock in the Washington Metropolitan Transit Area Authority (WMATA) rail system; which serves Washington, D.C. and parts of the neighboring states of Maryland and Virginia, USA. Excessive water leakage through the tunnel walls and the presence of water inside the underground facilities has damaged mechanical and electrical components in the tunnel, and has escalated the deterioration rate of the rail system and the associated infrastructure. WMATA and the USGS is currently investigating the hydrogeologic and geochemical controls on ground-water flow in the fractured rock setting. The poor hydraulic communication between saprolite and the competent bedrock can cause large reductions in the hydraulic head in the bedrock (approximately 20 meters) when pumping at rates of between 3 and 4 liters per minute. These results indicate that nominal pumping rates could be used to significantly lower the hydraulic heads adjacent to the subway tunnel and reduce water inflow.

CITY OF ABERDEEN WELLHEAD PROTECTION PLAN

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The City of Aberdeen developed a Wellhead Protection Plan during 2003-2004 to protect and improve groundwater quality and quantity withdrawn from the City supply wells. The City responded in part to the lack of viable alternatives to the supply wells, and the

vulnerability of the relatively shallow wells to potential contamination from Aberdeen Proving Ground (APG) and the commercial core of the City. The Wellhead Protection Plan addresses six discrete elements: source area delineation, aquifer susceptibility, management, monitoring, contingency planning, and public education. This presentation will focus on delineation (specifically hydrogeology and groundwater modeling), susceptibility, and management. The Management Plan forms the core of the Wellhead Protection Plan, as it specifies actions to be taken once the source area and contaminant susceptibility have been determined. The Management Plan was developed with guidance from a Technical Advisory Committee including community stakeholders from APG, the business community, and local and state government officials who evaluated the information and made practical, implementable recommendations.

The City passed an ordinance outlining the active land use management techniques to be applied within the City to protect and improve groundwater. A hazardous materials policy, an underground storage tank policy, site plan review for new sites, and a program of inspections and compliance plans for existing land uses highlight the ordinance.

AN INNOVATIVE WATERSHED MANAGEMENT TOOL TO ADDRESS WATER QUALITY

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Anne Arundel County is utilizing internal resources and consultant services to develop a Watershed Management Tool and Viewer (WMT&V) as part of its comprehensive Watershed Management Master Planning process. Stormwater pollution sources from existing urbanized areas must be addressed. Land Use must be managed properly to preserve and improve habitat quality, improve water quality, and reduce flooding. The WMT&V will link watershed data and models to give the County staff and stakeholders information on how changes in land use, zoning, best management practices, and other environmental conditions affect the watershed. The WMT&V will assist in identifying actions necessary to improve existing degraded conditions, and to facilitate more informed land use and development decisions by County staff and stakeholders in order to protect the resources of the County. The WMT&V contains four major components: 1) Database Repository, 2) Modeling Component, 3) Management Component, and 4) Visualization Component. Users are able to view existing GIS map layers, future map layers, and model results at their desktop. These components function as an integrated system that can be used by the County to examine successful management practices related to watershed health and stream restoration.

ARSENIC IN MARYLAND'S COASTAL PLAIN GROUNDWATER

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Arsenic is a known human carcinogen, with levels in drinking water above 300 micrograms per liter (μg/l) strongly associated with increased bladder and lung cancer mortality. Recognizing this, the United States Environmental Protection Agency recently revised its safe drinking water level from 50 μg/l to 10 μg/l. Yet, arsenic's carcinogenicity at levels below 50 μg/l is poorly understood. With assistance from the Maryland Geological Survey, the Maryland Department of the Environment, the Dorchester, Queen Anne's and Talbot County Health Departments, and Salisbury University, Johns Hopkins University is undertaking a project to characterize arsenic concentrations in groundwater in Maryland's Coastal Plain where levels range from less than 2 to 42 μg/l. This presentation will describe the initial phase of this project, in which eastern shore drinking water wells with elevated levels of arsenic were located using GPS technology. The presentation will then discuss how these locational data will be used in an epidemiologic study to assess possible associations between arsenic levels in groundwater used for drinking and the occurrence of bladder/lung cancers in Maryland residents living in this region. The specific aims of this future research are: (1): Conduct a spatial analysis of arsenic concentrations in groundwater to describe their range and variability both by area and with well depth; (2): Evaluate whether the mortality and incidence associated with bladder and lung cancers varies with exposure to arsenic in groundwater in Maryland's Coastal Plain. The strength of this study lies in the detailed characterization of arsenic levels,

both by area and well depth, in eastern Maryland groundwater. Through improved estimates of exposure, this work will augment understanding of the health effects associated with exposure to low levels of arsenic in drinking water and will improve the scientific foundation for implementing safe drinking water policy.

USING FLUROMETRIC DYE TRACING TO DELINEATE A WELLHEAD PROTECTION AREA FOR CLEAR SPRING, MD

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The Maryland Department of the Environment (MDE) has administered the wet/ dry weather bacteriological analysis of untreated (raw) water supplying public drinking water systems in Washington County, Maryland. In response to these findings, the Drinking Water Monitoring Section of MDE launched an investigation using the latest technological advances in fluorometric procedures to "tag and capture" potential sources of contaminated water that may be infiltrating the groundwater that supplies the Town of Clear Spring and Hoffman's Quality Meats located near Hagerstown. This investigation is designed to identify specific source(s) of contamination that may be causing the GWUDI systems and to further document regional groundwater dynamics and source water recharge areas.

ONSITE WASTEWATER TREATMENT SYSTEMS AS A WATER RESOURCE

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Well-planned and managed Onsite Wastewater Treatment Systems (OWTSs)/decentralized systems contribute to groundwater recharge by returning water to the immediate zone of use. Many areas of the U.S. which have undergone rapid development and sewering are experiencing lowered water tables and/or water shortages because ground water is no longer being recharged due to sewering and stormwater collection /conveyance systems. This is especially true when groundwater is pumped from wells for residential and nearby agricultural and commercial use. The combined effects of decreased groundwater recharge and increased water withdrawals often results in lower base flows in local rivers and streams, which affects habitat, aquatic life, and the quantity and quality of water available for human use. The presentation will identify opportunities for use of Onsite Wastewater Treatment Systems as a water resource, as well as some barriers.

RADIUM IN SEPTIC TANK EFFLUENT AND RADIUM-SOIL ADSORPTION

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Radium at concentrations higher than the drinking water standard (5 pci/l) was detected in some residential wells in the Millersville and Pasadena areas of Anne Arundel County. To improve water quality, homeowners have installed ion exchange units to remove radium from well water. Periodically, ion exchange units are backwashed with sodium chloride solution to restore ion exchange capacities. Wastewaters generated from the backwash process containing concentrated radium ions are disposed of via septic tank systems and eventually recharged back to the groundwater system. Maryland UIC Program received EPA incentive grants to conduct (1) Radium sampling study and (2) Study of radium adsorption on Maryland Soils Exemplified by Barium (II). The purpose of the sampling study is to investigate the variation of radium concentrations in the septic tank effluent during and after a backwash process. The purpose of the radium-soil adsorption study is to investigate the effectiveness of Maryland soils in removing radium. The radium-soil adsorption study was conducted by research staff from the University of Delaware.

LEAD IN DRINKING WATER – LEAD AND COPPER RULE AND LEAD CONTAMINATION CONTROL ACT

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On January 31, 2004, the front page of the Washington Post carried this headline: "Water in D.C. Exceeds EPA Lead Limit Random Tests Last Summer Found High Levels in 4,000 Homes Throughout City". What is the EPA Lead Limit? How random were those tests? Is this a problem that is unique to DC? In this session, find out the answers to these and other questions about Lead in Drinking Water.

THE MARYLAND STATE OBSERVATION-WELL NETWORK: STATUS AND PLANS

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The Maryland Geological Survey and the U.S. Geological Survey have maintained a network of wells for monitoring ground-water levels in Maryland since 1943. There are about 545 wells currently apportioned among 8 networks: Statewide, Southern Maryland (Power Plant Research Program), Anne Arundel, Calvert, St. Mary's, Charles, and Queen Anne's Counties, and Ocean City. Recently, a workgroup comprising representatives of State, Federal, and local agencies involved with the collection and use of ground-water-level data assessed the design and operation of the Network. After considering users' data needs, the workgroup designed an optimum network, making use of wells in existing networks and bringing in additional wells where needed. The workgroup identified two primary goals: 1) To characterize natural ground-water-level fluctuations driven by climatic factors and affected by variations in geology and other physical conditions; and 2) To describe and monitor changes and trends in ground-water levels affected by large-scale ground-water withdrawals in the confined aquifers of the Coastal Plain. Water-level data will be put into a database and made publicly available.

BACTERIAL CONTAMINATION OF DOMESTIC WELLS IN FLINSTONE, MD, REMEDIATION AND MANAGEMENT SOLUTIONS

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In the course of routine Non-community water supply tests last fall, Allegany County found a disturbing number of the commercial wells were returning positive results in the Flintstone area. We suspected that private wells, which are not subject to regular sampling, would also show pervasive contamination. Water quality in the Flintstone area is generally poor; subject to surface water infiltration and breakthroughs in an unconfined aquifer of limestone and fractured rock. The Environmental Health Division undertook a series of sanitary surveys and water samples for 75 wells in selected residential areas and verified that approximately

57% were contaminated to some degree, with 19% of those confirmed for E. coli. After disinfection, half of those resampled did not respond to treatment. Environmental Health staff met with the County Commissioners and Public Works Department to recommend undertaking a feasibility study to provide a public water supply for the residents of Flintstone and seek funding sources for construction and operation of a water treatment facility. We have coordinated public information meetings for Flintstone residents to keep them informed of our findings and the County's progress in finding a solution.

OCCURRENCE, PREVENTION, AND REMEDIATION OF ELEVATED TURBIDITY IN WELLS COMPLETED IN KARST, HAGERSTOWN VALLEY, MD

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Saint James School, Washington County, Maryland is located in the Hagerstown Valley Physiographic Province, which is characterized by classic karst environmental features. Elevated turbidity and discolored groundwater are common water quality problems in wells completed in karst terrain. Amy C. Martinez of Advanced Land and Water, Inc. (ALWI) investigated the potential causes of elevated turbidity concentrations and discolored water present in the Saint James School back-up groundwater supply well. Remedial efforts employed to understand and to control the turbidity problem included (1) a hydrogeologic and geologic investigation of the Saint James School terrain, (2) detailed well construction review, (3) water quality analysis of pre-remediation conditions, (4) borehole video log, (5) pump capacity selection and design, (6) well re-construction, (7) post-reconstruction water quality, and (8) standard groundwater well operating procedures. This presentation will focus on well siting, drilling, and testing methods that may prevent elevated turbidity problems in groundwater wells drilled in karst terrain. It will present methods to remediate elevated turbidity from existing turbidity-prone groundwater wells.

WELL YIELDS OBSERVED DURING TWO DROUGHT YEARS COMPARED WITH ESTIMATED YIELDS IN FRACTURED-ROCK AQUIFERS, CASE STUDIES

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A recent review of production and monitoring records collected during the 1999 and 2002 droughts was completed for 68 wells and two spring supplies in the fractured rock areas of Central Maryland (mostly municipal supplies in Frederick and Carroll counties). This study indicated that the average maximum drought production was 54% of the estimated yields using conventional methods, while it was 84% of the estimates made using the MDE methods. In addition, the production from 24 other wells was 21% of the estimates made using only conventional methods. While these data indicate that the MDE estimates were better, they may not have been conservative enough.

Several cases studies will be presented, which will include aquifer pumping test data, predicted sustained well yields, and available operational data demonstrating long-term, sustained drought yields.